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SEMICONDUCTOR PACKAGE MODULE STRUCTURE

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[There are no amendments to this patent.]

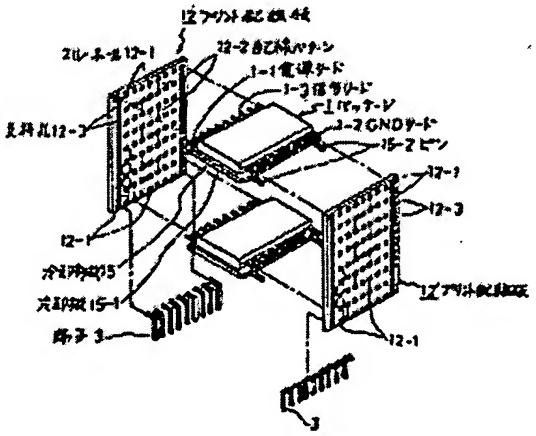
Abstract

Objective

This invention relates to a semiconductor package module structure widely used for circuit construction in all types of electronic equipment. Its objective is to enable cooling of high-density packaged packages as well as make assembly easy.

Constitution

In a semiconductor package module structure comprising semiconductor package (1) where leads (1-1), (1-2) and (1-3) are arranged to project in a planar form on opposite surfaces and printed wiring boards (12) and (12') with a plurality of rows of through holes (12-1) arranged at a fixed pitch, into which each of said leads (1-1), (1-2) and (1-3) of aforementioned semiconductor package (1) are inserted, a plurality of support holes (12-3) is furnished between said rows of through holes (12-1). A cooling member (15) is further furnished on which stands a plurality of pins (15-2) that are inserted into said support holes (12-3) of the aforementioned printed wiring boards (12) and (12') on both side surfaces of cooling plate (15-1), that cools by contacting aforementioned semiconductor package (1), to position said semiconductor package (1).



An oblique view that shows a semiconductor package module structure based on this invention

Key:

1	Package
1-1	Power source lead
1-2	Ground lead
1-3	Signal lead
3	Terminal
12	Printed wiring board
12'	Printed wiring board
12-1	Through hole
12-2	Wiring pattern

12-3 Support hole
15 Cooling member
15-1 Cooling plate
15-2 Pin

Claims

1. A semiconductor package module structure characterized in that, in a semiconductor package module structure comprising semiconductor package (1), where leads (1-1), (1-2) and (1-3) are arranged to project in a planar form on opposite surfaces, and printed wiring boards (12) and (12') with a plurality of rows of through holes (12-1) arranged at a fixed pitch, into which each of said leads (1-1), (1-2) and (1-3) of aforementioned semiconductor package (1) are inserted, a plurality of support holes (12-3) is furnished between said rows of through holes (12-1), and a cooling member (15) is further furnished on which stands a plurality of pins (15-2) that are inserted into said support holes (12-3) of the aforementioned printed wiring boards (12) and (12') on both side surfaces of cooling plate (15-1), that cools by contacting aforementioned semiconductor package (1), to position said semiconductor package (1).

Detailed explanation of the invention

[0001]

Industrial application field

This invention relates to a semiconductor package module structure that is widely used for circuit construction for all types of electronic equipment. Very recently, all types of electronic equipment in particular have been provided with many functions because of progress in miniaturization. Accompanying this, modules with a plurality of various types of semiconductor packages (hereafter abbreviated packages) stacked to be sandwiched by a pair of printed wiring boards are mounted on the printed circuit board units that constitute the circuits.

[0002]

However, problems have arisen, e.g., assembly of packages and printed wiring boards is difficult, and with higher-density packaging, heat generation is greater. So a new semiconductor package module that can solve these problems is required.

[0003]

Prior art

Package module structures widely used in the past, as shown in Figure 5(a), are constituted from packages (1) with power source lead (1-1), ground lead (1-2) and signal leads (1-3) arranged

to project in a planar form at a very small pitch from both side surfaces, a pair of one printed wiring board (2) with soldering through holes (2-1) into which individual leads (1-1), (1-2) and (1-3) are inserted arranged at a pitch approximately equal to the thickness of aforementioned packages (1) such that the bottommost row is used for connecting with terminals (3), such that the through holes (2-1) on the end into which power source leads (1-1) are inserted connect with an inner layer power source layer, not shown, and such that other through holes (2-1) are caused to conduct by surface wiring pattern (2-2), and another printed wiring board (2') with through holes (2-1) on the end into which ground leads (1-2) are inserted connected with an inner layer ground layer and other through holes (2-1) caused to conduct by wiring pattern (2-2), and multiple terminals (3) with fine wires which are of superior conductivity shaped like an L.

[0004]

For assembling these members, first, a terminal (3) is inserted and soldered in each through hole (2-1) (in the row at the bottom) formed in one edge of printed wiring boards (2) and (2') so that each terminal (3) projects in parallel from the bottom surfaces of printed wiring boards (2) and (2'). Then, for example, after a plurality of said packages (1) is stacked by inserting the power source leads (1-1) and signal leads (1-3) of packages (1) into their respective through holes (2-1) furnished in the one printed wiring board (2), the respective through holes (2-1) of the other printed wiring board (2') are fitted with ground leads (1-2) and signal leads (1-3) arranged on the other side of the packages (1).

[0005]

Next, as shown in Figure 5(b), a package module is constructed by soldering each of the through holes (2-1) in the pair of printed wiring boards (2) and (2'), that sandwiches the plurality of packages (1), and leads (1-1), (1-2) and (1-3) of each package (1) projecting through the through holes (2-1).

[0006]

Problems to be solved by the invention

A problem with the conventional module structure explained above is that the module is constructed by repeatedly positioning each of the leads (1-1), (1-2) and (1-3) arranged on both side surfaces of package (1) and the plurality of through holes (2-1) in each row and inserting said leads through the pair of printed wiring boards (2) and (2'), so the problem that occurs is that assembly of packages (1) is difficult for printed wiring boards (2) and (2'). Problems also occur related to cooling, since the entire module will produce a high amount of heat due to the fact that many packages (1) are packaged at high density.

[0007]

Power source lead (1-1) and ground lead (1-2) are also usually disposed at diagonal positions in packages (1). So with a module having a structure where both sides of packages (1) are sandwiched by a pair of printed wiring boards (2) and (2'), since power is supplied to the power source lead (1-1) of packages (1) from the one printed wiring board (2) and the other printed wiring board (2') connects with ground lead (1-2), there is also the problem that maintaining the potential precision of the power source and ground accurately will be difficult.

[0008]

The objective of this invention, in consideration of problems such as described above, is to provide a new semiconductor package module structure that will enable cooling of high-density packaged packages as well as making assembly easy, and that will also make it possible to mount packages in the correct position on the printed wiring board.

[0009]

Means for solving the problems

With this invention, as shown in Figure 1, in a semiconductor package module structure comprising semiconductor packages (1), where leads (1-1), (1-2) and (1-3) are arranged to project in a planar form on opposite surfaces, and printed wiring boards (12) and (12') with a plurality of rows of through holes (12-1), into which each of said leads (1-1), (1-2) and (1-3) of aforementioned semiconductor packages (1) are inserted, arranged at a fixed pitch, a plurality of support holes (12-3) is furnished between said rows of through holes (12-1), and as shown in Figure 2 cooling members (15) are further furnished on each of which stand two pins (15-2) on both side surfaces of cooling plate (15-1), that cools by contacting aforementioned semiconductor package (1), that are inserted into said support holes (12-3) of the aforementioned printed wiring boards (12) and (12') to position said semiconductor package (1).

[0010]

Operation

With this invention, as shown in Figure 4(a), by inserting and affixing a package (1) into the recessed part of cooling plate (15-1) on which stand two pins (15-2) on the two side surfaces, relative positioning of pins (15-2) of the cooling plate (15-1) and each lead (1-1), (1-2) and (1-3) of package (1) is accomplished.

[0011]

Then by inserting the tips of the two pins (15-2) of multiple cooling members (15) to which each of the packages (1) is attached into support holes (12-3) of the printed wiring boards (12) and (12') in sequence and closing the spacing of the printed wiring boards (12) and (12') as shown in Figure 4(b), each lead (1-1), (1-2) and (1-3) of each package (1) is inserted into each through hole (12-1), so module assembly will be easy.

[0012]

A cooling plate (15-1) with outstanding heat conductivity is affixed to the bottom part of each stacked package (1), so it will be possible to improve cooling performance for each package (1).

[0013]

Application example

An application example of this invention will be explained below with Figures 1 through 4. Figure 1 is an oblique view that shows a semiconductor package module structure based on one application example of this invention. Figure 2 is an oblique view that shows the cooling member of this application example. Figure 3 is a partial cross section that shows this application example assembled. Figure 4 is a front view that explains the operation of this invention. In the figures, the same symbols are assigned to the same members as in Figure 5. The additional (12) and (12') are printed wiring boards that sandwich the packages to connect externally, and (15) is a cooling member that supports and cools the package.

[0014]

Printed wiring boards (12) and (12'), as shown in Figure 1, have a plurality of rows of through holes (12-1), into which individual leads (1-1), (1-2) and (1-3) that project from the two side surfaces of packages (1) are inserted and connected, arranged at a somewhat larger pitch than the thickness of an aforementioned package (1). The bottommost row is used for connecting with terminals (3) the same as conventionally. Support holes (12-3) for supporting cooling members (15), discussed below, are placed at the same spacing as through holes (12-1) and formed at both ends of each row between the rows of aforementioned through holes (12-1), and the through holes (12-1) corresponding to the signal leads (1-3) of aforementioned packages (1) also form a pair of printed wiring boards that are connected with surface wiring pattern (12-2).

[0015]

In addition, in the one printed wiring board (12), as shown in Figure 3, all the through holes (12-1) into which power source leads (1-1) of packages (1) are inserted and, for example, an odd number of rows of support holes (12-3) arranged between them are connected with power source layer (12a), and an even number of rows of support holes (12-3) are connected with ground layer (12b). With the other printed wiring board (12'), through holes (12-1), into which ground leads (1-2) are inserted, and an even number of rows of support holes (12-3) are connected with ground layer (12'b) and an odd number of rows of support holes (12-3) are connected with power source layer (12'a) as with the aforementioned printed wiring board (12).

[0016]

With cooling member (15), as shown in Figure 2, a cooling plate (15-1), that is furnished with recessed part (15-1a) of dimensions so that said package (1) can be inserted and positioned, is formed from a metal sheet, for example, copper sheet, with outstanding electrical conductivity in dimensions somewhat larger than the external dimensions of aforementioned package (1), pins (15-2) for inserting into support holes (12-3) of aforementioned printed wiring board (12) stand on both opposing side surfaces with each lead (1-1), (1-2), and (1-3) positioned by recessed part (15-1a) of the cooling plate (15-1), and the entire surface, excluding the bottom surface of aforementioned recessed part (15-1a), is solder plated.

[0017]

With a semiconductor package module structure using the aforementioned member, as shown in Figure 1, a terminal (3) is inserted conventionally into each through hole (12-1) in one row arranged at the edge of printed wiring board (12) and soldered so that each terminal (3) protrudes in parallel from the side surface of printed wiring board (12). The bottom of recessed part (15-1a) of each cooling plate (15-1), shown in Figure 2, of the multiple cooling members (15) is coated with silicone adhesive (16), and the package (1) is integrated with cooling member (15) by being inserted into the recessed part (15-1a).

[0018]

Then power source lead (1-1) of package (1) that is integral with cooling member (15) as shown in Figure 4(a) is pointed toward printed wiring board (12). The tips of the two pins (15-2) that stand on cooling plate (15-1) are inserted in sequence into its support holes (12-3) so that multiple cooling members (15) that have been made integral with packages (1) are easily assembled in printed wiring board (12). Then the tips of the other pins (15-2) of each cooling

member (15) are inserted by the tip [sic] into each support hole (12-3) of printed wiring board (12').

[0019]

In this state, by decreasing the spacing until aforementioned printed wiring boards (12) and (12') contact at both opposite side surfaces of cooling plates (15-1) as shown in Figure 4(b), individual leads (1-1), (1-2) and (1-3) of the stacked packages (1) are inserted into individual through holes (12-1) of printed wiring boards (12) and (12') that sandwich them. Then, as shown in Figure 3, each of said leads (1-1), (1-2) and (1-3), each through hole (12-1), pins (15-2) of cooling member (15), and each of the aforementioned support holes (12-3) are soldered (4) to construct the module.

[0020]

The result is that the tips of the two pins (15-2) standing on each of the two side surfaces of cooling member (15) are inserted into each of the support holes (12-3) of printed wiring boards (12) and (12'). By decreasing the spacing, each lead (1-1), (1-2) and (1-3) of package (1) that is integral with each cooling member (15) is inserted into each of the through holes (12-1), so module assembly will be easy. Each cooling plate (15-1) is also adhered to each of the stacked packages (1), so module cooling performance improves.

[0021]

Power source layers (12a) and (12'a) of printed wiring boards (12) and (12') are also connected by an odd number of stages of cooling members (15). Also, in the odd number stages, ground layers (12b) and (12'b) conduct, so the potential precision of the power source and ground can be accurately maintained.

[0022]

Effect of the invention

As is evident from the explanation above, with this invention, the advantages are that cooling and assembly of packages that are packaged at high density are easy with an extremely simple construction, and the packages can be placed at the correct positions on printed wiring boards. It can provide a semiconductor package module structure with which remarkable economic and reliability improvement effects can be expected.

Brief description of the figures

Figure 1 is an oblique view that shows a semiconductor package module structure based on this invention.

Figure 2 is an oblique view that shows the cooling member of this application example.

Figure 3 is a partial cross section that shows this application example assembled.

Figure 4 is a front view that shows the operation of this invention.

Figure 5 is an oblique view that shows a conventional semiconductor package module structure.

Explanation of symbols

(1) is a package, (1-1) a power source lead, (1-2) a ground lead, (1-3) a signal lead, (3) a terminal, (4) solder, (12) and (12') printed wiring boards, (12a) and (12'a) power source layers, (12b) and (12'b) ground layers, (12-1) a through hole, (12-2) a wiring pattern, (12-3) a support hole, (15) a cooling member, (15-1) a cooling plate, (15-1a) a recessed part, (15-2) a pin, and (16) an adhesive.

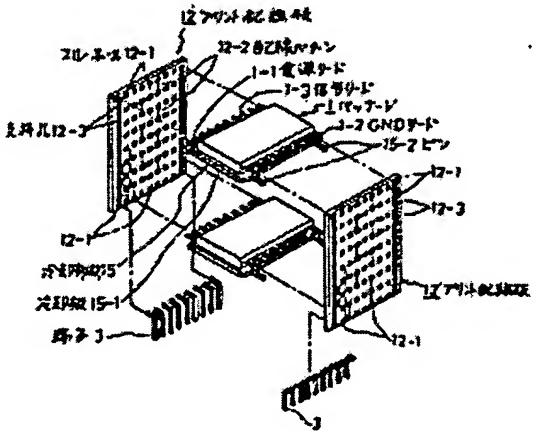


Figure 1. An oblique view that shows a semiconductor package module structure based on this invention

Key:

1	Package
1-1	Power source lead
1-2	Ground lead
1-3	Signal lead
3	Terminal
12	Printed wiring board
12'	Printed wiring board
12-1	Through hole
12-2	Wiring pattern
12-3	Support hole
15	Cooling member
15-1	Cooling plate

15-2 Pin

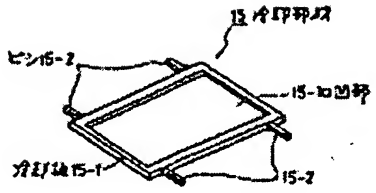


Figure 2. Oblique view that shows the cooling member of this application example

Key: 15 Cooling member
15-1 Cooling plate
15-1a Recessed part
15-2 Pin

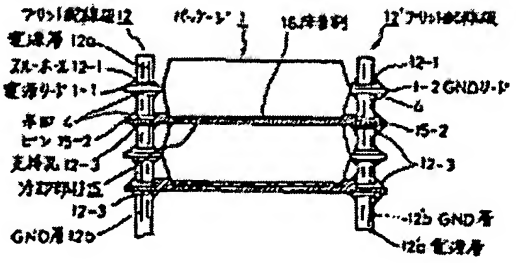


Figure 3. Partial cross section that shows this application example assembled

Key: 1 Package
1-1 Power source lead
1-2 Ground lead
4 Solder
12 Printed wiring board
12' Printed wiring board
12a Power source layer
12b Ground layer
12'a Power source layer
12'b Ground layer
12-1 Through hole
12-3 Support hole
15 Cooling member
15-2 Pin
16 Adhesive

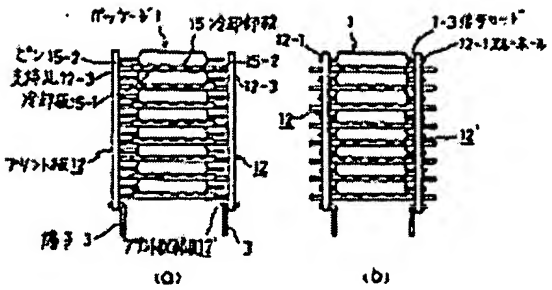


Figure 4. Front view that shows the operation of this invention

Key: 1 Package
1-3 Signal lead
3 Terminal
12 Printed wiring board
12' Printed wiring board
12-1 Through hole
12-3 Support hole
15 Cooling member
15-1 Cooling plate
15-2 Pin

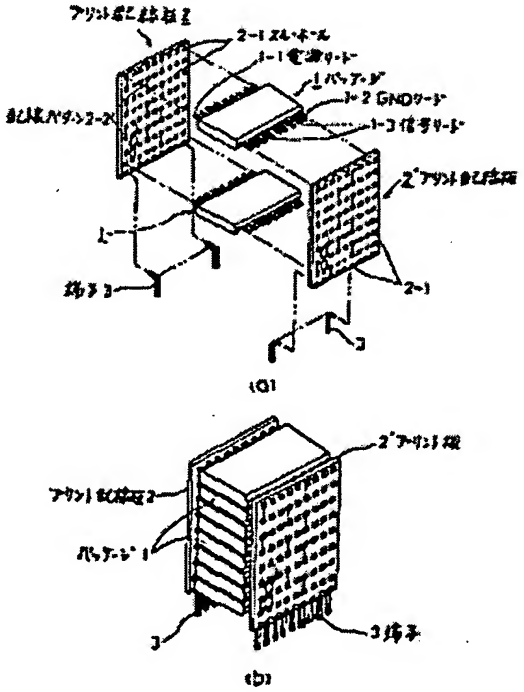


Figure 5. Oblique view that shows a conventional semiconductor package module structure

Key: 1 Package
1-1 Power source lead

1-2 Ground lead
1-3 Signal lead
2 Printed wiring board
2' Printed wiring board
2-1 Through hole
2-2 Wiring pattern
3 Terminal

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MODULE STRUCTURE OF SEMICONDUCTOR PACKAGE

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ABSTRACT:

PURPOSE:To improve economy, reliability by facilitating cooling and assembling of a high density mounting package with a simple construction and correctly mounting it.

CONSTITUTION:Leads 1-1, 1-2, 1-3 protrude from the opposed surfaces of a semiconductor package 1. A plurality of rows of through holes 12-1 in which the leads are inserted, are provided at a predetermined pitch on printed circuit boards 12, 12'. A plurality of supporting holes 12-3 are provided at the intermediate of the rows of the holes 12-1. Pins 15-2 stood on a cooling member 15 are inserted into the holes 12-3. The board 12' side are similar. With the construction, the package can be correctly

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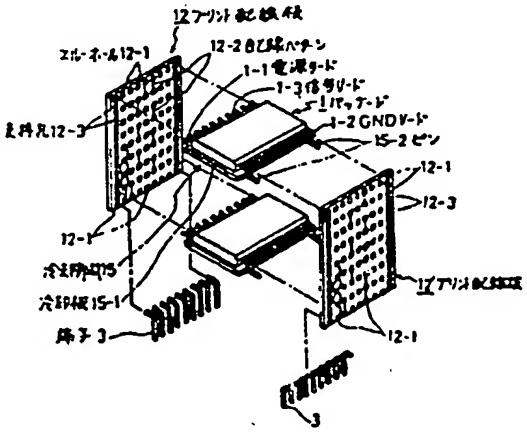
(54)【発明の名称】　半導体パッケージのモジュール構造

(57)【要約】
【目的】　本発明は各種電子機器の回路構成に広く使用される半導体パッケージのモジュール構造に関し、高密度実装されたパッケージを冷却可能にするとともに組み立てが容易となることを目的とする。
【構成】　対向する側面にリード1-1,1-2,1-3 を平面状に突出させて配列した半導体パッケージ1と、上記半導体パッケージ1の各該リード1-1,1-2,1-3 を挿入するスルーホール12-1の列を一定ピッチで複数列配設したプリント配線板12,12' よりなる半導体パッケージのモジュール構造において、当該スルーホール12-1列の中間に複数個の支持孔12-3を配設して、上記半導体パッケージ1に接触することにより冷却する冷却板15-1の両側面に、上記プリント配線板12,12' の該支持孔12-3に挿入して当該半導体パッケージ1の位置決めを行うピン15-2をそれぞれ複数本立設した冷却部材15を更に設ける。

本発明の一実施例による半導体パッケージのモジュール構造を示す斜視図



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【特許請求の範囲】

【請求項1】　対向する側面にリード(1-1,1-2,1-3)を平面状に突出させて配列した半導体パッケージ(1)と、上記半導体パッケージ(1)の各該リード(1-1,1-2,1-3)を挿入するスルーホール(12-1)の列を一定ピッチで複数列配設したプリント配線板(12,12')よりなる半導体パッケージのモジュール構造において、上記スルーホール(12-1)列の中間に複数個の支持孔(12-3)を配設して、該半導体パッケージ(1)に接触することにより冷却する冷却板(15-1)の両側面に、上記プリント配線板(12,12')の該支持孔(12-3)に挿入して当該半導体パッケージ(1)の位置決めを行うピン(15-2)をそれぞれ複数本立設した冷却部材(15)を更に設けたことを特徴とする半導体パッケージのモジュール構造。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、各種電子機器の回路構成に広く使用される半導体パッケージのモジュール構造に関する。最近、特に各種電子機器は多くの機能を備えるとともに小型化が進み、それに伴って回路を構成するプリント板ユニットには各種半導体パッケージ（以下パッケージと略称する）を複数個重ね合わせて一対のプリント配線板で挟持したモジュールが搭載されている。

【0002】しかるに、パッケージとプリント配線板との組み立てが困難であるとともに、高密度実装されるにしたがって発熱量が多くなるという問題が生じているので、これらの問題を解決することができる新しい半導体パッケージのモジュール構造が必要とされている。

【0003】

【従来の技術】従来広く使用されているパッケージのモジュール構造は、図5(a)に示すように電源リード1-1,GNDリード1-2 および信号リード1-3 を両側面から微小ピッチで平面状に突出させて配列したパッケージ1と、この各リード1-1,1-2,1-3 を挿入して半田付けするスルーホール2-1 を前記パッケージ1の厚みと略等しいピッチで配設して最下部の一列を端子3の接続用とし、電源リード1-1 が挿入される側縁のスルーホール2-1 は図示していない内層の電源層と接続するとともに、他のスルーホール2-1 を表面の配線パターン2-2 で導通させた一方のプリント配線板2と、GNDリード1-2 を挿入される側縁のスルーホール2-1 を内層のGND層と接続して、他のスルーホール2-1 を配線パターン2-2 で導通させた他方のプリント配線板2'の一対と、導電性の優れた細線をL字形に成形した複数本の端子3から構成されている。

【0004】これらの部材の組立は、先ずプリント配線板2，2'の一端縁に形成された（下部となる一列の）各スルーホール2-1 に端子3を挿入・半田付けして、各端子3をプリント配線板2，2'の下部端面より平行に突出させる。そして、例えば一方のプリント配線板2に配設

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されたそれぞれのスルーホール2-1 に、パッケージ1の電源リード1-1 および信号リード1-3 を挿入することにより複数個の当該パッケージ1を重ね合わせた後に、他方のプリント配線板2'のそれぞれスルーホール2-1 をパッケージ1の他方側に配列されたGNDリード1-2 と信号リード1-3 に嵌入している。

【0005】次に、図5(b)に示す如く複数個のパッケージ1を挟持した一対のプリント配線板2，2'のそれぞれスルーホール2-1 と、そのスルーホール2-1 より突出した各パッケージ1のリード1-1,1-2,1-3 とを半田付けすることによりパッケージのモジュールが構成されている。

【0006】

【発明が解決しようとする課題】以上説明した従来のモジュール構造で問題となるのは、パッケージ1の両側面に配列されたリード1-1,1-2,1-3 のそれぞれと、一対のプリント配線板2，2'に穿設された各列の多数個のスルーホール2-1 を位置合わせを行って挿入することを順次繰り返すことでモジュールを構成しているために、プリント配線板2，2'に対するパッケージ1の組み立てが困難であるという問題が生じるとともに、多数個のパッケージ1を高密度に実装することによりモジュール全体が高発熱となるから冷却に対する問題も発生している。

【0007】また、一般にパッケージ1には電源リード1-1 とGNDリード1-2 が対角の位置に配設されているから、一対のプリント配線板2，2'でパッケージ1の両サイドを挟持する構造のモジュールでは、一方のプリント配線板2からパッケージ1の電源リード1-1 に電源を供給し、他方のプリント配線板2'はGNDリード1-2 と接続するために、電源とGNDの電位精度を正確に保つことが困難になるという問題もある。

【0008】本発明は上記のような問題点に鑑み、高密度実装されたパッケージを冷却可能にするとともに組み立てが容易なり、かつパッケージをプリント配線板の正しい位置に実装することができる新しい半導体パッケージのモジュール構造の提供を目的とする。

【0009】

【課題を解決するための手段】本発明は、図1に示すように対向する側面にリード1-1,1-2,1-3 を平面状に突出させて配列した半導体パッケージ1と、上記半導体パッケージ1の各該リード1-1,1-2,1-3 を挿入するスルーホール12-1の列を一定ピッチで複数列配設したプリント配線板12,12'よりなる半導体パッケージのモジュール構造において、当該スルーホール12-1列の中間に複数個の支持孔12-3を配設して、図2に示すように上記半導体パッケージ1に接触することにより冷却する冷却板15-1の両側面に、上記プリント配線板12,12'の該支持孔12-3に挿入して当該半導体パッケージ1の位置決めを行うピン15-2を各2本立設した冷却部材15を更に設ける。

【0010】

【作用】本発明では、図4(a)に示すように両側面にそれぞれ2本のピン15-2を立設した冷却板15-1の凹部にパッケージ1を挿入して接着することにより、冷却板15-1のピン15-2とパッケージ1の各リード1-1,1-2,1-3との相対的な位置決めが行われる。

【0011】そして、それぞれパッケージ1を接着した複数の冷却部材15の2本のピン15-2の先端を順次プリント配線板12,12'の各支持孔12-3に挿入し、図4(b)に示す如くプリント配線板12,12'の間隔を縮めることでそれぞれパッケージ1の各リード1-1,1-2,1-3が各スルーホール12-1に挿入されるからモジュールの組み立てが容易になる。

【0012】また、積層された各パッケージ1の下部には熱伝導の優れた冷却板15-1がそれぞれ接着されているので、各パッケージ1に対しての冷却性能を向上することが可能となる。

【0013】

【実施例】以下図1乃至図4について本発明の実施例を説明する。図1は本発明の一実施例による半導体パッケージのモジュール構造を示す斜視図、図2は本実施例の冷却部材を示す斜視図、図3は本実施例の組立状態を示す部分断面図、図4は本発明の作用を説明する正面図を示し、図中において、図5と同一部材には同一記号が付してあるが、その他の12,12'はパッケージを扶持して外部とを接続するプリント配線板、15はパッケージを支持して冷却する冷却部材である。

【0014】プリント配線板12,12'は、図1に示すようにパッケージ1の両側面から突出した各リード1-1,1-2,1-3を挿入して接続するスルーホール12-1列を、前記パッケージ1の厚みより若干大きなピッチで複数列配設して最下部の一列を従来と同様に端子3の接続用とし、後述する冷却部材15の扶持用支持孔12-3を前記スルーホール12-1列の中間で、各列の両端に形成されたスルーホール12-1と同一間隔となるように配設するとともに、上記パッケージ1の信号リード1-3と対応するスルーホール12-1は表面の配線パターン12-2と接続した一対のプリント配線板を形成している。

【0015】さらに、一方のプリント配線板12には、図3に示すようにパッケージ1の電源リード1-1が挿入される全スルーホール12-1と、その中間に配設された例えば奇数列の支持孔12-3を電源層12aと接続し、偶数列の支持孔12-3はGND層12bと接続している。また、他方のプリント配線板12'では、GNDリード1-2が挿入されるスルーホール12-1および偶数列の支持孔12-3はGND層12'bと接続して奇数列の支持孔12-3は前記プリント配線板12と同様に電源層12'aと接続している。

【0016】冷却部材15は、図2に示すように前記パッケージ1の外形寸法より若干大きな寸法に成形した導電性の優れた金属板、例えば銅板に、当該パッケージ1を

板15-1を形成し、その冷却板15-1の凹部15-1aで位置決めされたパッケージの各リード1-1,1-2,1-3側で対向する両側面に、上記プリント配線板12の支持孔12-3に挿入して位置決めするためのピン15-2を立設して、前記凹部15-1a底面を除く全表面に半田めっきを施している。

【0017】上記部材を使用した半導体パッケージのモジュール構造は、図1に示すようにプリント配線板12の一端縁に配列された一列の各スルーホール12-1に、端子3を従来と同様に挿入して半田付けを行ってそれぞれの端子3がプリント配線板12の端面より平行に突出させる。また、複数の冷却部材15の図2に示す冷却板15-1の凹部15-1a底面にそれぞれシリコン系の接着剤16を塗布して、その凹部15-1aにパッケージ1を挿入することにより冷却部材15と一体にする。

【0018】そして、図4(a)に示すようにこの冷却部材15と一体にしたパッケージ1の電源リード1-1をプリント配線板12の方に向け、この支持孔12-3に冷却板15-1の立設した2本のピン15-2先端部を順次挿入して、パッケージ1と一体になった複数個の冷却部材15をプリント配線板12に軽く組み立てた後に、それぞれ冷却部材15の他方のピン15-2先端部をプリント配線板12'の各支持孔12-3に先端部を挿入する。

【0019】この状態で、図4(b)に示すように冷却板15-1の対向する両側面に前記プリント配線板12と12'が接触するまでその間隔を縮めることにより、積層したパッケージ1の各リード1-1,1-2,1-3が扶持するプリント配線板12,12'の各スルーホール12-1に挿入される。そして、図3に示すように当該各リード1-1,1-2,1-3と各スルーホール12-1および冷却部材15のピン15-2と前記各支持孔12-3を半田4付けしてモジュールを構成している。

【0020】その結果、冷却部材15の両側面に立設したそれぞれ2本のピン15-2先端部をプリント配線板12,12'の各支持孔12-3に挿入して、その間隔を縮めることによりそれぞれ冷却部材15と一体になったパッケージ1の各リード1-1,1-2,1-3が各スルーホール12-1に挿入されるからモジュールの組み立てが容易になるとともに、積層される各パッケージ1にはそれぞれ冷却板15-1が接着されているのでモジュールの冷却性能が向上する。

【0021】また、奇数段の冷却部材15によりプリント配線板12,12'の電源層12a,12'aが接続されるとともに奇数段ではGND層12b,12'bが導通するので電源とGNDの電位精度を正確に保つこともできる。

【0022】

【発明の効果】以上の説明から明らかなように本発明によれば極めて簡単な構成で、高密度実装されたパッケージの冷却と組み立てが容易になるとともにパッケージをプリント配線板の正しい位置に実装することができる等の利点があり、著しい経済的及び、信頼性向上の効果が期待できる半導体パッケージのモジュール構造を提供することができる。

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【図面の簡単な説明】

【図1】　本発明の一実施例による半導体パッケージのモジュール構造を示す斜視図である。

【図2】　本実施例の冷却部材を示す斜視図である。

【図3】　本実施例の組立状態を示す部分断面図である。

【図4】　本発明の作用を示す正面図である。

【図5】　従来の半導体パッケージのモジュール構造を示す斜視図である。

【符号の説明】

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1はパッケージ、　　1-1は電源リード、
1-2はGNDリード、　　1-3は信号
3は端子、　　4は半
12、12'はプリント配線板、　　12a、12'a
12bはGND層、　　12-1
15は冷却板、15-1aは凹部、
15-2はピン、16は接着剤。

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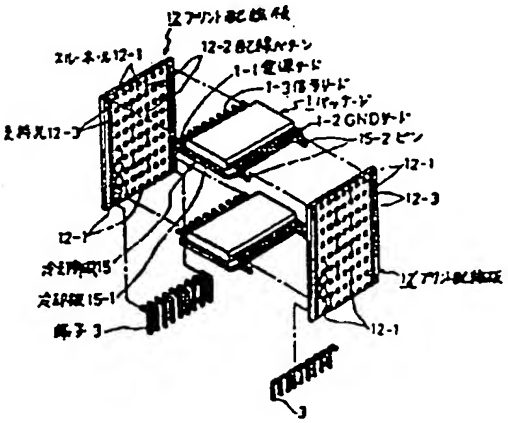
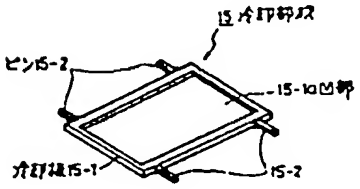
【図1】

本発明の一実施例による半導体パッケージのモジュール構造を示す斜視図



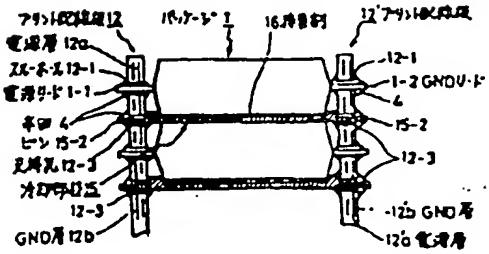
【図2】

本実施例の冷却部材を示す斜視図



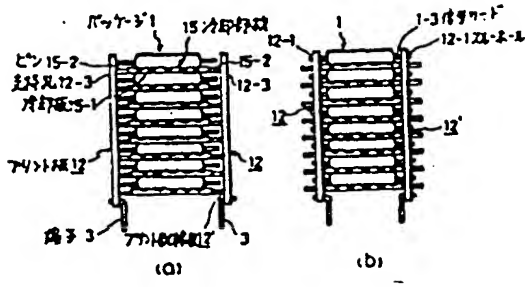
【図3】

本実施例の組立状態を示す部分断面図



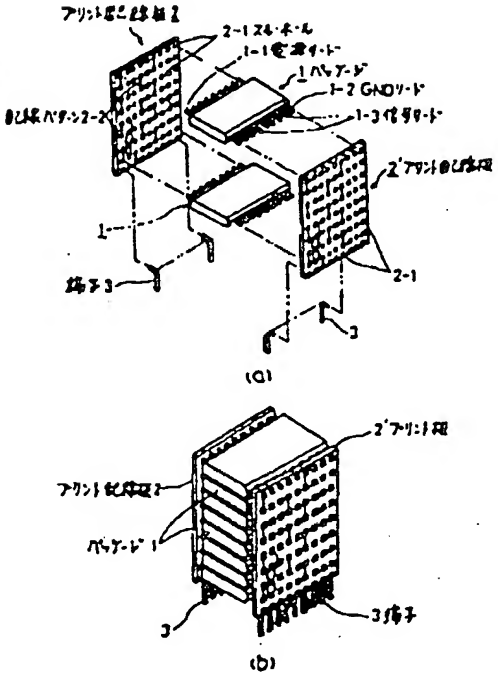
【図4】

本発明の作用を示す正面図



【図5】

従来の半導体パッケージのモジュール基板を示す斜視図



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